

2016 Agricultural Technology and Mechanical Systems CDE

The Agricultural Technology and Mechanical Systems Career Development Event is intended for teams of 3-4 students, with the top 3 individual scores counted toward the overall team score.

For this event, students must come prepared with proper safety equipment, including welding jackets, closed-toe leather shoes, safety glasses and welding gloves. Official FFA Dress is not required for this event.

The National FFA Organization theme for this event in 2016 is “Animal Production Systems.” This is reflected in components (C) and (D) of this format.

NOTE: IF STUDENTS WISH TO INCORPORATE A JIG INTO THIS YEAR’S WELDING ASSIGNMENT (RECOMMENDED, NOT REQUIRED), THEY MUST MAKE THE JIG IN ADVANCE AND BRING IT WITH THEM TO CONVENTION. UPON ADVANCE REQUEST BY THEIR CHAPTER ADVISOR, THEY WILL BE SENT 6 METAL PIECES FOR PRACTICE PURPOSES WHICH WILL BE OF THE SAME DIMENSIONS AS THOSE THEY WILL RECEIVE AT CONVENTION TO COMPLETE THE WELDING ASSIGNMENT.

The following components will be included in this event:

- (A) Welding with stick and MIG welder. Six metal pieces will be provided to students at Convention to weld. Three of these pieces will be welded together along each their edges (total of two edge welds) using a stick welder and the other three the same (again a total of two edge welds) using a MIG welder.

It is suggested that FFA members make ahead of time and bring to Convention a jig to hold their pieces in place. If students follow this suggestion, this jig must already be built prior to the event. There will be no time to build a jig at the CDE. A series of photos will be posted at the Maine FFA website explaining the step by step assembly of the pieces.

Regardless of whether students build a jig, a hole will be pre-drilled on each end of the part they make. This will need to be matched with the corresponding holes in the other device they weld. How close they fit to a standard will be scored. Refer to the photos! Student can practice welding, before they get to Convention, these pieces to achieve this result and can construct on their own, the jig that they will bring to Convention with them. FFA members will get six new un-welded pieces of metal at the contest site which they will weld.

- (B) General Knowledge Test – questions will be taken from among those posted at the end of this format.
- (C) Animal Water Pump Trouble Shooting – Each team will trouble shoot a water pump intended to pump water for animals. By the end of their trouble shooting, the pump should function adequately for them to pump water from one location to another.
- (D) Model Animal Shelter – Students will build out of index cards and 2 inch pieces of tape a scale model for a large animal shelter (suitable for horses, cows or buffalo), including a second floor for storing hay. Judges will test strength of student creations in front of all students at event. See attached sheet for more information.
- (E) Electrical Circuit – Teams will complete a simple electrical circuit using materials and instructions provided. An example of the circuit to be assigned will be posted on the Maine FFA website. <https://www.youtube.com/watch?v=-R8EhNDd738>

Participants will be scored as follows:

Top 3 scores count for overall team score

	<u>Individual</u>	<u>Team Points</u>
Team Activity (Water Pump)	1 /3 of team	90 points
Welding (MIG and stick)	30 points	90 points
Team Activity (Electricity)	1 /3 of team	90 points
Animal Shelter Model	1 /3 of team	90 points
General Knowledge Exam	<u>30 points</u>	<u>90 points</u>
Total points possible	150 points	450 points

Tiebreaker

The team score for the event will be determined by adding all the points earned by adding individual points as listed above. The following activities will be used to break ties between individuals and/or teams:

The highest written exam scores; if still tied top welding scores

Agricultural Technology and Mechanical Systems CDE Score Sheets

2016

Name and FFA Chapter	General Knowledge	Team Electrical Activity	Welding Section	Team Water Pump	Animal Shelter	Place
1.						
2.						
3.						
4.						
1.						
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1.						
2.						
3.						
4.						

2016 Ag Mechanics CDE

Welding Segment

MIG Section Scoring

Point Value	What judges will look for
1 2 3	No visible imperfections or spatter damage
1 2 3 4	High quality appearance
1 2	Proper welding apparel
1 2	Safety glasses worn at all times
1	Check for hazards
1 2	Proper handling of hot materials
1	Clean up and tool return
	Total points earned (15 possible)

Stick Welding Segment

Point value	What the judge is looking for
1 2 3	All pieces fit properly and are correctly located.
1 2 3	High quality appearance
1 2	Proper welding apparel
1 2	Safety glasses worn at all times
1	Check for hazards
1 2	Proper chipping
1	Safe handling of hot metal
1	Clean up and tool return
	Total points earned (15 possible)

Ag Mechanics Team Activity

You are working on a farm which requires pumping of water from a reservoir to a storage tank for utilization by livestock. The engine will not run and you must get this running soon.

The engine does not require disassembly of engine. The complaint is simply that it will not start.

Use proper troubleshooting to determine the problem. Fix the problem and pump water from point "A" to point "B".

Scoring:

1. Utilize proper troubleshooting technique.
 - (1) Check oil.....4 points_____
 - (2) Check fuel.....4 points_____
 - (3) Check ignition4points _____
 - (4) Check compression.....4 points_____
2. Engine runs properly10 points _____
3. Water pumped in the allotted time frame4 points _____

Total points _____

Total X 3 _____

Ag Mechanics Special Projects Section

Team Activity

This winter the snow totals have been lower than normal. Last year the opposite conditions occurred. Record totals meant that roofs and buildings were stressed resisting the heavy snow loads.

For this section of the CDE you will produce a prototype (model) for an animal shelter that will be free standing in a pasture. The structure could contain horses, cows, or sheep. The model will be at least 15.5 centimeters in height and support as much weight as possible.

A supplied cylinder will replicate the turning space and headroom needed by one animal. The bottom floor must allow two of those cylinders to fit vertically. The cylinders are slightly less than 80 mm in height and 70 mm in diameter.

The building must have 3 surface levels. Level one will be where the animals reside. Level two will contain hay, grain, and small equipment for the remote shelter. Level three will be the roof.

Design criteria:

- Materials will be 40 index cards 77 mm(3 inches) X 128 mm(5 inches)
- One roll of transparent office tape
- Index cards may be folded but not torn
- A scale (rule) will be provided
- No pieces of tape longer than 50 mm (2 inches)
- Model may not be taped to testing surface
- Height will be measured to lowest part of roof.
- Roof must be designed to hold test weights
- Weights will be added until roof sags or sidewalls shift
- The model must hold this weight at least 10 seconds
- Each index card not used will add 10 units to total weight (10 cards = 100 grams)
- Team with greatest total weight will get maximum points
- Formula { Your total weight ÷ top weight = _____ X 30 }

TOTAL points _____

Teams are urged to build a trial model **before** they come to the FFA State Convention and enter this CDE. They may make sketches of what they will build since they will only have **25 minutes** to build a complete model. They may not bring a pre-manufactured model into the CDE area. Must work as a TEAM to get this done.

Agricultural Technology and Mechanical Systems Questions

These questions will be on the general examination portion of the State Ag Mechanics CDE.

Mark all answers on the answer sheet using a pencil. Read each question carefully and identify the correct single answer. Use the blank sheet of paper to do all the scratch work. Students will need a calculator to complete this examination, but they are not allowed to share a calculator with another student.

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1. What is the name of the device to measure tractor PTO (power take-off) horsepower?

- A. Dynamometer
- B. Load cell
- C. Wattmeter
- D. Calorimeter

2. A diesel engine produces blue-colored exhaust. What is the most likely cause?

- A. Low engine temperature
- B. Combustion of engine oil

C. Restricted air intake

D. Turbocharger failure

3. Which hydraulic system component converts mechanical energy into hydraulic energy?

A. Hydraulic pump

B. Relief valve

C. Directional control valve

D. Actuator (such as a hydraulic cylinder)

4. A twenty-foot-long dump truck bed is 54 inches deep and seven feet wide. What is the approximate capacity of the truck bed in cubic yards if a load is struck level across the top?

A. 23 yd³

B. 70 yd³

C. 210 yd³

D. 630 yd³

5. Which of the following is the safest way to drive a loader uphill with a full bucket?

- A. Back straight up the hill
- B. Drive forward straight up the hill
- C. Drive forward diagonally across the slope of the hill
- D. One method is not safer than another

6. When the piston of the four stroke small engine reaches the bottom of the cylinder on the intake stroke it starts upward on what stroke?

- A. Exhaust
- B. Combustion
- C. Compression
- D. Power

7. The intake valve of a 4-stroke single-cylinder small engine is opened and closed by the action of what component?

- A. Piston
- B. Throttle
- C. Wrist pin
- D. Camshaft

8. In four-stroke small gasoline engines, how fast does the camshaft turn with respect to the speed of the crankshaft?

- A. The camshaft turns at one-half the speed of the crankshaft
- B. The camshaft turns at the same speed as the crankshaft
- C. The camshaft turns at twice the speed of the crankshaft

9. What is the name given to the printed safety information that must be kept on file for each hazardous material kept or used in a small engine shop?

- A. Safety Detection Sheet
- B. Safety Deterrent System
- C. Safety Data Sheet
- D. Safety Depreciation System

10. In electrical terminology, what is the meaning of the abbreviation AC?

- A. Arc current
- B. Always current
- C. Alternating current
- D. Acetylene current

11. Which of the following statement is correct with respect to wearing safety glasses while welding?

- A. Safety glasses are not needed for other metal working activities as long as a face shield is worn while welding
- B. Safety glasses should be darkly tinted to protect the eyes at all times while performing metal working activities
- C. Safety glasses should be worn continuously while working with or near metal working activities
- D. Safety glasses are not needed when a welding helmet is worn, because the helmet protects the eyes from all welding related hazards

12. Approximately how much time is required to remove 750 round hay bales from a field if bale transport can be completed at an average hauling rate 11.5 bales per hour?

Note: 1 hour= 60 minutes.

- A. 64 hours and 48 minutes
- B. 65 hours and 2 minutes
- C. 65 hours and 13 minutes
- D. 65 hours and 22 minutes

13. A tractor fueled by No. 2 diesel burns 7.75 gallons per hour. When the same tractor is fueled with B20 biodiesel it burns 8.25 gallons per hour. Approximately how many more gallons of fuel will the tractor use during eight hours of operation if it is fueled by B20 biodiesel rather than No. 2 diesel?

- A. 2.5 gallons
- B. 3.0 gallons
- C. 3.5 gallons
- D. 4.0 gallons

14. What tractor power train component directs power equally to both rear wheels to prevent the loss of traction that occurs when one wheel is slipping?

- A. Drawbar lock
- B. Differential lock
- C. Transmission lock
- D. Final drive lock

15. If the measured tractor wheel slippage is zero, what adjustment can increase wheel slippage?

- A. Drive 2 miles per hour slower
- B. Drive 2 miles per hour faster
- C. Add more ballast on the tractor
- D. Remove ballast from the tractor

16. Why do engine manufacturers recommend that fuel stabilizer be added to fuel left in gasoline engines, such as lawnmowers and snow blowers, when the equipment will not be used from one season to the next?

- A. To prevent the engine valves from rusting
- B. To prevent the cylinder liner(s) from rusting
- C. To prevent the gasoline from breaking down
- D. To prevent the oil from entering the gasoline

17. When a hydraulic leak is suspected to originate from an implement hose, which of the following is the correct procedure to locate the leak?

- A. Use your finger to find the origin of the leak
- B. Use the back of your hand to locate the origin of the leak
- C. Wrap duct tape around the hose to locate the origin of the leak
- D. Use a piece of cardboard to locate the origin of the leak

18. Which of the following statements about the American Wire Gauge (AWG) conductor rating system is true?

- A. The smaller the AWG number the larger the wire
- B. The larger the AWG number the larger the wire
- C. The smaller the AWG number the smaller the wire
- D. The smaller the AWG number the longer the wire

19. A non-metallic sheathed cable that contains two #12 insulated conductors (white and black) and one bare grounding conductor would be identified by which of the following markings?

- A. 12-3WG
- B. 12-2 WG
- C. 14-2 WG
- D. 10-2WG

20. At least how many inches of free conductors shall be left at each outlet, junction, and switch point for splices or the connection of fixtures or devices?

- A. 2 inches
- B. 6 inches
- C. 12 inches
- D. 5 inches

21. When operating a tractor on a road or highway, which of the following is correct regarding brakes?

- A. Lock the left and right brake pedals together so that the both the left and right brakes assist while braking
- B. Make sure the left and right brake pedals are not locked together so the brakes can assist with steering
- C. Use the left brake for low speed braking and the right brake for high speed braking
- D. Do not use the brakes to control speed when traveling on roads or highways

22. When servicing the engine on a push mower always:

- A. disconnect the spark plug wire
- B. remove the gasoline
- C. engage the engine stop lever
- D. attach the grass catcher

23. The major danger posed to a bystander by a walk behind rotary mower is

- A. thrown object
- B. rollover
- C. crushing
- D. pinch points

24. Which of the following is appropriate footwear for mowing with a walk behind rotary mower?

- A. bare feet
- B. sandals
- C. canvas shoes
- D. leather shoes

25. Under what circumstance must a slow moving vehicle (SMV) sign be displayed on agricultural machinery?

- A. When machinery will NOT be operated on public roads
- B. When machinery is operated on public roads
- C. Only on machinery that will operate on interstate highways.
- D. Only on machinery that will be transported on a trailer

26. Which of the following statements about a tractor-loader's center of gravity is true?

- A. It is always in the same place
- B. It changes depending upon the operator's hours of use
- C. It changes as the position of the loader changes
- D. It is located ten feet behind the loader

27. The National Electric Code (NEC) requires that conductor insulation be color-coded. Which of the following conductor insulation colors indicates the grounded conductor?

- A. Green
- B. Black
- C. White
- D. Red

28. What is the recommended eye protection shade number for a welding helmet lens used when arc welding with 1/8-inch electrodes?

- A. No. 4 lens shade
- B. No. 6 lens shade
- C. No. 8 lens shade
- D. No. 10 lens shade

29. When pulling or towing a trailer with a tractor, what is the correct place to connect the load?

- A. The tractor's rear axle
- B. The lower arms of the tractor's three-point hitch
- C. The tractor's drawbar
- D. The top link of the tractor's three-point hitch

30. When “stick” welding the protective cloud that surrounds the weld zone is produced by _____.

- A. argon that is added from a hi pressure tank
- B. the flux on the outside of the consumable rod
- C. oxygen and acetylene supplied by the welding torch
- D. the flux located on the inside of the consumable wire